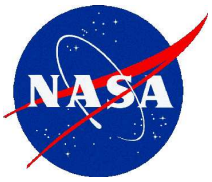

National Aeronautics and
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OMPS PEATE System Requirements Document

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1 Overview

1.1 Introduction

The Office of Earth Science (OES) of the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration's (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS) Integrated Program Office (IPO), have agreed to jointly implement a mission called the NPOESS Preparatory Project (NPP).

NPP has the objectives listed below.

1. Demonstrate and validate:
   (a) A global imaging radiometer and a suite of two sounding instruments, associated algorithms, and data processing
   (b) The Ozone Mapping and Profiling Suite (OMPS) instrument, associated algorithms, and data processing
   (c) A NPP Command, Control and Communications Segment (C3S), an Interface Data Processing Segment (IDPS), an Archive and Distribution Segment (ADS), and a Science Data Segment (SDS).
2. Provide continuity of systematic, global, calibrated, validated and geo-located Earth science imaging radiometry, sounding observations, and ozone mapping and profiling observations for NASA Earth Science research.

The SDS will include a number of Product Evaluation and Test Elements (PEATEs) that will perform various levels of analysis on NPP calibration parameters and data products as necessary to determine data quality

1.2 Document Overview

This document, the *OMPS PEATE System Requirements Document*, enumerates the system requirements for the OMPS PEATE.

1.3 Referenced Documents

Ref	Doc ID	Document	Version
1		*NPP SDS Level 1 Requirements*	
2	`OMPS-CONOP-0.9.1`	*OMPS PEATE Concept Of Operations*	0.9.1

2 Project Summary

2.1 Background

The NPP OMPS instrument has three components (in two boxes):

1. Nadir Ozone Mapper similar to OMI
2. Nadir Profiler similar to SBUV
3. Limb Profiler similar to SCIAMACHY

In the IDPS system, RDRs (Level 0 data) from all three instrument components will be processed into SDRs (Level 1B). The SDRs will, in turn, be processed into ozone EDRs (Level 3) and intermediate products (IPs). Processing in the IDPS will be done with IPO-provided software. The following ozone EDRs and IPs will be generated by the IDPS and archived in the ADS:

EDR: OMPS Total Column Ozone (derived from the Nadir Ozone Mapper)

EDR: OMPS Ozone Limb Profile (derived from the Limb Profiler)

IP: OMPS Ozone Nadir Profile (derived from the Nadir Profiler)

The NASA OMPS Science Team is tasked with jobs in the following areas; the OMPS PEATE needs to support this work:

1. Independent analysis in support of OMPS calibration/validation
2. OMPS SDR and EDR algorithm improvement
3. Assessment of IDPS-generated EDRs for use as CDRs

Calibration

The NASA OMPS Science Team is called upon to perform an independent analysis in support of OMPS calibration and validation. Although on-orbit calibration assessment is the main thrust, pre-launch artifacts, methods, and software need to be examined as well. The OMPS Science Team will do different things for each of the OMPS components.

The OMPS Nadir Mapper is similar to OMI at first order, but once on orbit, it will have its own characteristics. Post-launch, the NASA OMPS Science Team will need to examine the OMPS SDRs in order to investigate calibration issues. Assessment will be done by examining the SDRs themselves, but the investigation will also include application of soft calibration techniques developed for TOMS and OMI. Applying soft calibration techniques will help explore instrument artifacts as well as the original SDR processing software capabilities.

The Nadir Profiler uses new technology and the Limb Profiler is all new. As for the Nadir Mapper, the NASA OMPS Science Team will need to assess SDRs. External calibration techniques developed for SBUV will be applied to the Nadir Profiler, but new techniques will have to be devised for the Limb Profiler.

Unlike the VIIRS instrument that will have an independent calibration characterization team (the NCST) that is part of the NASA SDS project, the OMPS instrument will have no such a team. Instead, the NASA OMPS Science Team will have to do all calibration-related work within the scope of the other tasks (algorithm improvement and EDR assessment).

Algorithm Improvement

The IPO-provided software that will be used in the IDPS is based on old versions of the algorithms. The Nadir Mapper algorithm is derived from the Version 7 TOMS algorithm. A newer version, Version 8, developed for TOMS and adapted for OMI, is now available. Similarly, the Nadir Profiler algorithm is based on the SBUV Version 6 software. However, for nadir profiling, a Version 8 algorithm, developed for SBUV2 exists; and additional algorithms for OMI are being developed in the U.S. and in Europe. And the Limb Profiler algorithm that will run in the IDPS is derived from the SOLSE-LORE algorithm. At the same time, limb profiling work is in progress in the U.S. and in Europe to develop improved approaches. Furthermore, it is already known that the current NPP pointing (altitude) algorithm is inadequate for NASA's climate research requirements. Significant improvements to the IDPS algorithms for processing ozone are already in existence and further improvements will be available in the near future. The NASA OMPS Science Team will show significance of the existing improvements as well as continue developing further improvements in the science software.

Assessment of EDRs as CDRs

NASA's Climate Research has a number of requirements (which are beyond the scope of this document). The IDPS-provided ozone products (EDRs) are said to be possibly adequate as CDRs. The NASA OMPS Science Team will make detailed studies of the EDRs and assess the quality of the existing EDRs against NASA CDR requirements.

Summary

For the calibration support, algorithm improvements, and EDR assessments, the NASA OMPS Science Team will undertake the following tasks:

1. Assess performance of the three algorithms (OMPS Total Column Ozone, OMPS Ozone Limb Profile, OMPS Ozone Nadir Profile).
2. Assess calibration of the instruments.
3. Develop and apply calibration adjustments and soft calibration techniques.
4. Develop assessment and Level 3 tools.
5. Demonstrate the impact of bringing algorithms up to the current state of art.
6. Implement suggested improvements into quasi-operational software.
7. Develop and operate a data system in order to demonstrate overall mission impact of suggested improvements.
8. Implement current operational IDPS-provided software so it functions in the OMPS PEATE.

9. Support field and validation campaigns.

For the calibration support, algorithm improvements, and EDR assessments, the OMPS PEATE needs to provide for the NASA OMPS Science Team a data analysis environment with appropriate tools as well as a software development environment.

2.2 System Description

The OMPS PEATE is a system supporting NASA scientists that evaluate NPP ozone data products and the OMPS instrument calibration. It is a component within the Ozone CARS and a subset of the SDS. Called for in NASA's NPP SDS Level 1 Requirements [1], the SDS – and thus each PEATE – is directed to assess and verify NPP product quality and suitability to meet NASA's science research needs. Paraphrasing and interpreting the Level 1 Requirements document, an OMPS PEATE is to do the following:

1. Function as an independent element of the SDS dedicated to OMPS data and leverage existing SIPS resources (NPP L1 Requirement Section 2.1.2.4).

2. Acquire OMPS RDRs, SDRs, and EDRs from the ADS (NPP L1 Requirement Section 2.1.2.2).

3. Assess the quality of the NPP EDRs for use as NASA CDRs (NPP L1 Requirement Section 2.1.2).

4. Generate sample CDRs and store them as needed in support of assessing EDR quality; the ADS will not store PEATE-generated products (NPP L1 Requirement Section 2.1.2.1).

5. Provide suggested EDR algorithm improvements to the IDPS (NPP L1 Requirement Section 2.1.2.3).

6. Process selected OMPS data subsets into research data products for conducting independent analysis in support of IPO NPP Calibration/Validation (NPP L1 Requirement Section 2.2.2).

The PEATE includes common resources that scientists need. Commonality is handy in a coordinated effort that deals with more than a handful of computer files. The resources include a computer system that will be used in a number of ways. Most of the required system can be easily created by hosting a copy of a reconfigured OMIDAPS SIPS and support software on a suite of hardware dedicated to OMPS.

For examining large amounts of data and complex software algorithms, a number of existing tools and processes are needed. Included are resources to store and manage data and software. Also needed are resources to run science and engineering tools. Tools would include, for example, IDL, HDF utilities, and so on. Computer resources would include disk space and a process for managing and organizing the storage and people-access to it so that the effort is harmonious without putting undue burden on the scientists. Experience from past projects taught us several techniques that OMI scientists now use for organizing and coordinating various artifacts.

In addition to examining and evaluating data and algorithms, the NASA OMPS Science Team needs to create potential improvements to the data and to the software that generated the data. Any potential improvements need to be tested against large amounts of input files in order to support statistically meaningful evaluations. Proposed science improvements need to be also checked for adverse impact on existing data. The PEATE needs to facilitate access for the Science Team to computing resources that permit running potential improvements against large amounts of varied inputs.

To make proposed improvements in algorithms, the Science Team needs to prototype software. Since the improvements will eventually need to run on a large shared processing system, there is a need for uniformity in development and coordination between the team members. There is also the potential to leverage common resources so that Science Team members do not replicate efforts. By providing a shared software development environment, with a number of commonly needed resources, the PEATE can save the Science Team time and sweat as well as facilitate more interaction between members.

Along with a modern software development environment comes a need for infrastructure that projects generally expect. For example, a web site for sharing information and distributing resources is part of

most projects these days. Similarly, a software configuration control system is necessary whenever large amounts of diverse software are dealt with. And an electronic document repository and management system is needed. The PEATE will provide such shared functions as it will provide uniformity and coordination, and thus reduce the things that the Science Team needs to worry about themselves.

3 Requirements

3.1 Assumptions

The requirements that follow are based on a number of assumptions. If any of the assumptions will not be met, then either new requirements will have to be added, or it will not be possible to meet some of the requirements listed in Sections 3.2 and on.

3.1.1 The OMPS PEATE will get representative synthetic OMPS RDR data from pre-launch tests of the IDPS at least 18 months prior to launch.

3.1.2 The OMPS PEATE will get representative OMPS SDR data from pre-launch tests of the IDPS at least 12 months prior to launch.

3.1.3 The OMPS PEATE will get representative OMPS EDR data from pre-launch tests of the IDPS at least 6 months prior to launch.

3.1.4 The OMPS PEATE will get representative real instrument OMPS RDR data from pre-launch tests of OMPS at least 3 months prior to launch.

3.1.5 The OMPS PEATE will have access to operational (IDPS) source code that is used for SDR, IP, and EDR production.

3.1.6 The OMPS PEATE will have access to all the NPP ATBDs and software documentation.

3.1.7 The OMPS PEATE will have access to any toolkits and utilities used in IDPS processing.

3.1.8 The OMPS PEATE staff will have the capability of compiling and running unmodified IDPS executables while porting the software to the OMPS PEATE; there will be at least one computer account available to OMPS PEATE staff members on a system (perhaps the I&TS) that runs the same compilers as the development system on which IDPS software is built. The login account will provide enough resources for OMPS PEATE staff to compile and run small isolated tests/experiments with the IDPS software.

3.1.9 NCST will not perform any calibration activities for OMPS.

3.1.10 The NPP Aerosol EDRs will be handeled by the Land PEATE (not the OMPS PEATE).

3.1.11 “Soft Calibration” is a useful method for doing QA on products over short term (six data months) and long term (several data years) periods.

3.2 General Requirements

3.2.1 Calibration

The OMPS PEATE shall support the NASA OMPS Science Team in evaluating OMPS calibration for each of the three instrument parts.

3.2.1.1 The OMPS PEATE shall support the NASA OMPS Science Team in studying the OMPS pre-launch calibration process.

3.2.1.2 The OMPS PEATE shall support the NASA OMPS Science Team in studying the OMPS post-launch calibration process.

3.2.1.3 The OMPS PEATE shall support the NASA OMPS Science Team in studying OMPS pre-launch calibration artifacts.

3.2.1.4 The OMPS PEATE shall support the NASA OMPS Science Team in characterizing post-launch OMPS calibration changes.

3.2.1.5 The OMPS PEATE shall support the NASA OMPS Science Team in identifying and resolving OMPS post-launch calibration artifacts.

3.2.1.6 The OMPS PEATE shall support the NASA OMPS Science Team in managing and storing calibration artifacts (data files) that were obtained for study.

3.2.1.7 The OMPS PEATE shall support the NASA OMPS Science Team in coding, testing, running, and characterizing possible calibration improvements.

3.2.2 Data Analysis

The OMPS PEATE shall support the NASA OMPS Science Team in studying ozone-related data products (OMPS RDRs, SDRs, EDRs, and IPs).

3.2.2.1 The OMPS PEATE shall support the NASA OMPS Science Team in evaluating OMPS SDR and OMPS EDR products for accuracy.

3.2.2.2 The OMPS PEATE shall support the NASA OMPS Science Team in assessment of OMPS instrumental corrections (e.g., dark current, South Atlantic Anomaly, wavelength calibration, temperature sensitivity, nonlinearity, change with time).

3.2.2.3 The OMPS PEATE shall support the NASA OMPS Science Team in assessment of Ozone EDR internal consistency (e.g., analysis of interannual repeatability, short-term stability, etc.).

3.2.2.4 The OMPS PEATE shall support the NASA OMPS Science Team in assessments of the effectiveness of flagging and masking algorithms (e.g., clouds, glint, stray light, zenith angle limits).

3.2.2.5 The OMPS PEATE shall support the NASA OMPS Science Team in OMPS EDR assessment for accomplishing climate research.

3.2.2.5.1 The OMPS PEATE shall support the NASA OMPS Science Team in obtaining comparison ozone-related products from other satellite missions and ground truth measurement campaigns.

3.2.2.5.2 The OMPS PEATE shall support the NASA OMPS Science Team in comparing unmodified OMPS products against data from other satellite missions and ground truth measurement campaigns.

3.2.2.5.2.1 The OMPS PEATE shall support the NASA OMPS Science Team in developing comparison tools (e.g., IDP programming, Fortran and C programming, etc.).

3.2.2.5.2.2 The OMPS PEATE shall support the NASA OMPS Science Team in running comparisons.

3.2.2.5.2.3 The OMPS PEATE shall support the NASA OMPS Science Team in analyzing algorithm improvements for OMPS products.

3.2.2.5.2.4 The OMPS PEATE shall support the NASA OMPS Science Team in analyzing comparison results.

3.2.3 Algorithm Improvement

The OMPS PEATE shall support the NASA OMPS Science Team in developing candidate SDR (L1B) and EDR (L2 and L3) algorithm improvements for each of the three instrument parts.

3.2.3.1 The OMPS PEATE shall support pre-launch assessment of OMPS SDR, EDR, and IP algorithm functionality and implementation.

3.2.3.2 The OMPS PEATE shall support post-launch assessment of OMPS SDR, EDR, and IP algorithm functionality and implementation.

3.2.3.3 The OMPS PEATE shall support the NASA OMPS Science Team in obtaining, examining, and running software obtained from the IDPS.

3.2.3.4 The OMPS PEATE shall support the NASA OMPS Science Team in managing and tracking IDPS definitions of software changes.

3.2.3.5 The OMPS PEATE shall support the NASA OMPS Science Team in developing conceptual algorithm improvements to SDR and EDR algorithms for each of the three instrument parts.

3.2.3.6 The OMPS PEATE shall support the NASA OMPS Science Team in coding candidate algorithm improvements to SDR and EDR algorithms for each of the three instrument parts.

3.2.3.7 The OMPS PEATE shall support the NASA OMPS Science Team in testing and characterizing candidate improvements made to SDR and EDR algorithm software.

3.2.3.8 The OMPS PEATE shall support processing of RDRs into SDRs using standard IPO-provided software with alternate LUTs provided by the NASA OMPS Science Team.

3.2.3.9 The OMPS PEATE shall support processing of SDRs into EDRs using standard IPO-provided software with alternate LUTs generated by the NASA OMPS Science Team.

3.2.3.10 The OMPS PEATE shall support the NASA OMPS Science Team by developing and generating a variety of data for testing candidate algorithms (either reformating existing GOME, OMI, SCIAMACHY data, or – if necessary – creating analytically simulated data).

3.2.3.11 The OMPS PEATE shall support the NASA OMPS Science Team in documenting software that was developed in the course of the mission.

3.2.3.12 The OMPS PEATE shall support the NASA OMPS Science Team by maintaining source code configuration control and documentation of software that was developed in the course of the mission.

3.2.4 Coordination and Support

The OMPS PEATE shall provide general support and coordination resources.

3.2.4.1 The OMPS PEATE shall support the NASA OMPS Science Team in managing and storing project documentation.

3.2.4.2 The OMPS PEATE shall support the NASA OMPS Science Team in sharing information and data.

3.2.4.3 The OMPS PEATE shall support the NASA OMPS Science Team in providing support to the NPP project (reviews of tasks, NPP effort, OMPS, and IPO).

3.2.4.4 The OMPS PEATE shall support the NASA OMPS Science Team in providing information to, and collecting responses from, the external ozone science community.

3.3 Functional Requirements

3.3.1 Data Ingest

3.3.1.1 The OMPS PEATE shall automatically ingest the full stream of OMPS RDR from external sources.

3.3.1.2 The OMPS PEATE shall automatically ingest the full stream of OMPS SDRs from external sources.

3.3.1.3 The OMPS PEATE shall automatically ingest the OMPS Total Column Ozone EDR from external sources.

3.3.1.4 The OMPS PEATE shall automatically ingest the OMPS Ozone Limb Profile EDR from external sources.

3.3.1.5 The OMPS PEATE shall automatically ingest the OMPS Ozone Nadir Profile IP from external sources.

3.3.1.6 The OMPS PEATE shall automatically ingest ancillary data from external sources.

3.3.1.7 The primary external source for RDR, SDR, EDR, and IP data shall be the SD3.

3.3.1.8 The alternate external source for RDR, SDR, EDR, and IP data shall be the ADS.

3.3.1.9 The OMPS PEATE shall automatically ingest additional ancillary data from the original sources (e.g., NOAA/NESDIS, NASA, USGS, JPL, NOAA Space Environment Center, USNAVO).

3.3.1.9 The OMPS PEATE shall ingest, store, and manage OMPS calibration files.

3.3.2 Data Tracking/Catalog

3.3.2.1 The OMPS PEATE shall catalog all data that it stores.

3.3.2.2 The OMPS PEATE shall provide functions to view and access its science data inventory (i.e., browse, search, order) to the NASA OMPS Science Team.

3.3.2.3 The OMPS PEATE shall make available status information about files in its archive within one minute of each file's ingest completion.

3.3.3 Data Processing

3.3.3.1 Command Line

3.3.3.1.1 The OMPS PEATE shall permit execution of candidate algorithm improvements on a single-run basis from the command line.

3.3.3.2 Automated Execution

3.3.3.2.1 The OMPS PEATE shall permit execution of candidate algorithm improvements in bulk (many runs initiated by a single command).

3.3.3.2.2 The OMPS PEATE shall permit scheduling one or more executions of an algorithm against any input data including future data that may not be available yet on the system.

3.3.3.2.3 The OMPS PEATE shall automatically execute a scheduled science algorithm instance once all required inputs are available on the system.

3.3.3.2.4 The OMPS PEATE processing system shall provide information to the OMPS Science Team and to data system operations about its state and the algorithms it is executing at all times.

3.3.3.2.5 The OMPS PEATE shall make event status information available within one minute of each event occurrence.

3.3.4 Data Export

3.3.4.1 The OMPS PEATE shall be capable of exporting all science data that it holds.

3.3.4.2 Export shall permit the OMPS Science Team to place standing orders for OMPS L0-L3 and ancillary data stored in the OMPS PEATE.

3.3.4.3 Export shall permit placing standing orders for future data not yet stored in the OMPS PEATE.

3.3.4.4 Export shall put no limit on the number of standing orders that any one OMPS Science Team member may place.

3.3.4.5 Export shall be capable of delivering data files specified while using the browse/search and order functions.

3.3.4.6 The standing orders function shall deliver science data automatically (communication resources permitting) as soon as the files are available in the OMPS PEATE archive.

3.3.4.7 Export shall be capable of FTP-pushing science data directly to an OMPS Science Team member's remote computer (assuming no fire walls on the recipient's side).

3.3.4.8 Export shall be capable of staging requested science data on a local OMPS PEATE disk outside of the OMPS PEATE's firewalls and informing the recipient by e-mail on how to FTP-pull the files.

3.3.4.9 Export shall be capable of delivering (push or stage) data to OMPS Science Team members in response to ad-hoc browse and order sessions.

3.3.4.10 Export shall deliver each requested data set (one or more files) as a single (tar-format) file.

3.3.4.11 Export shall permit users to individually specify whether it should deliver compressed or uncompressed tar files.

3.3.4.12 Export shall be capable of compressing data that it delivers.

3.3.5 Data Storage

3.3.5.1 The OMPS PEATE shall store 100 percent of OMPS RDRs (L0 data) for the duration of the mission plus 12 months. [this requirement is in support of tracking changes in calibration over the life of the mission]

3.3.5.2 The OMPS PEATE shall store 100 percent of OMPS SDRs (L1B data) for the duration of the mission plus 12 months. [this requirement is in support of tracking calibration improvement impact on all of the mission's data]

3.3.5.3 The OMPS PEATE shall store 100 percent of OMPS EDRs (OMPS Total Column Ozone EDR and OMPS Ozone Limb Profile EDR) for the duration of the mission plus 12 months. [this requirement is in support of verifying algorithm improvement impact on all of the mission's data]

3.3.5.4 The OMPS PEATE shall store 100 percent of OMPS IPs (OMPS Ozone Nadir Profile IP) for the duration of the mission plus 12 months. [this requirement is in support of verifying algorithm improvement impact on all of the mission's data]

3.3.5.5 The OMPS PEATE shall have capacity to store 3 times plus 10 percent of SDRs, EDRs, and IPs at any point in the mission. The capacity may increase with time as IDPS produces data. The 3 times storage is used as follows: copy "1" are IDPS-produced files; copy "2" is data generated by the latest stable candidate algorithm improvement; copy "3" is data generated by the latest work in progress candidate algorithm improvement. Copies 2 and 3 would be compared to each other (in order to see if work in progress is better than the previous improvement). Copies 1 and 3 would be compared to see whether or not the work in progress is significant compared to the original IDPS-generated data set.

3.3.5.6 The OMPS PEATE shall store TBD samples (TBD volume) of comparison data from other missions (for example, TOMS, GOME, Sciamachy, OMI).

3.3.5.7 The OMPS PEATE shall provide functions that show the bulk storage in a simplified abstract view (i.e., hide the physical hierarchy of the storage system).

3.3.5.8 The OMPS PEATE shall manage science data files in an arbitrary number of abstract groups that are logically isolated from each other (i.e., archive sets).

3.3.5.9 The OMPS PEATE shall provide status information about its archive system (e.g., which machines and disks are up/down, how full is the archive, what is the storage capacity of the archive, how busy is the archive vs. its full I/O capability).

3.3.6 Metadata

3.3.6.1 The OMPS PEATE shall provide functions that create appropriate metadata for products generated on the OMPS PEATE.

3.3.6.1.1 The metadata shall include a unique version number of the software that produced the file. [e.g., PGEVersion]

3.3.6.1.2 The metadata shall include information stating that the file was produced by a candidate algorithm improvement running on the OMPS PEATE (and not by IDPS software).

3.3.6.1.3 The metadata shall make each new file unique (even when the same software is re-executed using exactly the same inputs). [for example, include production date and time to the nearest second]

3.3.6.1.4 The metadata shall identify the processing system and host.

3.3.6.1.5 The metadata shall list the date and time (to the nearest second) of the execution. [e.g., ProductionDateTime]

3.3.6.1.6 The metadata shall include the file name that the file should carry. [e.g., LocalGranuleID]

3.3.6.1.7 The metadata shall list all input files used to create the product. [e.g., InputPointer]

3.3.6.1.8 The metadata shall list versions of all the inputs (whenever input files carry such information). [e.g., InputVersions]

3.3.7 Versioning

3.3.7.1 The OMPS PEATE shall provide for versioning of software that is to run on the OMPS PEATE.

3.3.7.2 Versioning shall include provisions for identifying project phases, scientifically significant changes, and insignificant changes.

3.3.7.3 Versioning shall include provisions for identifying support-team changes to the software.

3.3.8 File Formats

3.3.8.1 The OMPS PEATE shall provide support to candidate algorithm improvement software developers so they can produce files in IDPS-native file formats (for easy comparison of IDPS-generated and OMPS PEATE-generated products).

3.3.8.2 The OMPS PEATE shall support file formats consistent with the IDPS (e.g., HDF).

3.3.9 Comparison Data

3.3.9.1 The OMPS PEATE shall acquire samples of data from other missions (for example, TOMS, GOME, Sciamachy, OMI) as needed by the NASA OMPS Science Team.

3.3.9.2 The OMPS PEATE shall reformat acquired data from these other missions to OMPS format if requested by the OMPS Science Team.

3.4 Interface Requirements

3.4.1 Machines

3.4.1.1 SD3

3.4.1.1.2 The OMPS PEATE shall automatically retrieve OMPS RDRs and all associated metadata from the SD3.

3.4.1.1.3 The OMPS PEATE shall automatically retrieve OMPS SDRs and all associated metadata from the SD3.

3.4.1.1.4 The OMPS PEATE shall automatically retrieve OMPS EDRs (OMPS Total Column Ozone EDR and OMPS Ozone Limb Profile EDR) and all associated metadata from the SD3.

3.4.1.1.5 The OMPS PEATE shall automatically retrieve OMPS IPs (OMPS Ozone Nadir Profile IP) and all associated metadata from the SD3.

3.4.1.2 ADS/CLASS

3.4.1.2.1 The OMPS PEATE shall be capable of automatically retrieving the same data from ADS as it normally retrieves from SD3.

3.4.1.3 Ancillary Data Sources

3.4.1.3.1 The OMPS PEATE shall automatically retrieve ancillary data files from various providers on an as-needed basis.

3.4.1.4 Calibration Data

3.4.1.4.1 The OMPS PEATE shall retrieve calibration data files and calibration process artifacts from the IDPS.

3.4.2 Humans

3.4.2.1 Operator Interface

3.4.2.1.1 The OMPS PEATE shall provide an operator interface.

3.4.2.1.2 The Operator interface shall permit running the OMPS PEATE.

3.4.2.1.3 The Operator interface shall permit scheduling and running algorithms against arbitrary inputs.

3.4.2.1.3.1 The Operator interface shall permit “Add to Schedule.”

3.4.2.1.3.2 The Operator interface shall permit “Modify Schedule.”

3.4.2.1.3.3 The Operator interface shall permit “Delete from Schedule.”

3.4.2.1.3.4 The Operator interface shall permit “Run algorithm.”

3.4.2.1.3.5 The Operator interface shall permit “Pause algorithm.”

3.4.2.1.3.6 The Operator interface shall permit “Pre-emptive Abort algorithm.”

3.4.2.1.3.7 The Operator interface shall permit “Non-Pre-Emptive Terminate algorithm.”

3.4.2.1.4 The Operator interface shall permit quantitative monitoring of the OMPS PEATE status and performance.

3.4.2.1.4.1 The Operator interface shall permit quantitative monitoring of Ingest.

3.4.2.1.4.2 The Operator interface shall permit quantitative monitoring of Export.

3.4.2.1.4.3 The Operator interface shall permit quantitative monitoring of Processing.

3.4.2.1.4.4 The Operator interface shall permit quantitative monitoring of System Health.

3.4.2.1.5 The Operator interface shall permit full monitoring and control of the OMPS PEATE across the network from any number of remote locations.

3.4.2.1.6 The Operator interface shall be protected (perhaps by passwords) so that only authorized people can use it.

3.4.2.2 NASA OMPS Science Team

3.4.2.2.1 The OMPS PEATE shall provide an interface for the NASA OMPS Science Team.

3.4.2.2.2 The interface shall permit viewing of the OMPS PEATE’s status.

3.4.2.2.3 The interface shall permit monitoring of the OMPS PEATE’s production.

3.4.2.2.4 The interface shall permit viewing of the inventory of data files resident on the OMPS PEATE.

3.4.2.2.5 The interface shall permit browse and order of all data out of the full inventory.

3.4.2.2.6 The interface shall permit users to upload individual files out of the full inventory.

3.4.2.2.7 The interface shall permit upload of many files out of the full inventory as a single file (i.e., tar-format).

3.4.2.2.8 The interface shall be protected so that only authorized people can use it.

3.4.2.2.9 The interface shall require users to register before they are permitted to gain initial access.

3.4.2.2.10 The interface shall keep a record of which user uploaded what file(s) and when.

3.4.2.2.11 The interface shall not place any limits on how much data users may upload.

3.4.2.3 IPO

3.4.2.3.1 The OMPS PEATE shall receive IDPS software from the IPO that was used to produce SDRs, EDRs, and IPs. The software will be made available to the NASA OMPS Science Team to study.

3.4.2.3.2 The OMPS PEATE shall accomodate received software that includes complete source code.

3.4.2.3.3 The OMPS PEATE shall accomodate received software that includes all available documentation.

3.4.2.3.4 The OMPS PEATE shall accomodate received software that includes binary (IDPS-native) executables (so that if there is a problem reproducing a product on the OMPS PEATE, a run can be attempted with the executables on an IDPS-like machine in order to test whether the problem lies in the build process or in some other incompatibilities).

3.4.2.3.5 The OMPS PEATE shall accomodate received software that includes all data (e.g., table lookup) files required by the software to execute.

3.4.2.3.6 The OMPS PEATE shall accomodate received software that includes any available support tools (e.g., table generators).

3.4.2.3.7 The OMPS PEATE shall accomodate received software that includes input files for one execution.

3.4.2.3.8 The OMPS PEATE shall accomodate received software that includes one set of output files that were generated by the IDPS using the provided version of the software and the provided input data files.

3.4.2.3.9 The OMPS PEATE shall accomodate received software that includes any special tools or items needed in building and running the software.

3.4.2.3.10 The OMPS PEATE shall receive a specification for the manufacturer, model, and version of compilers and software development tools used in creating the software that generated the products being evaluated.

3.4.2.3.11 The OMPS PEATE shall check for, detect, and acquire any changes related to OMPS software (data processing software or support software) at the IDPS.

3.4.2.3.12 The OMPS PEATE shall receive throughout the duration of the mission updates to any information obtained from the IPO.

3.4.2.3.13 The OMPS PEATE shall provide a mechanism TBD for delivering candidate algorithm improvements to the IPO.

3.5 Performance Requirements

3.5.1 Ingest Volumes

3.5.1.1 The OMPS PEATE shall ingest data volumes as shown in Table 1.

Table 1: OMPS PEATE Ingest Data Volumes

OMPS RDRs	2642.46 MB/data-day
OMPS SDRs	3435.2 MB/data-day
OMPS Total Column Ozone EDR	0.1819 MB/data-day
OMPS Ozone Limb Profile EDR	0.0309 MB/data-day
OMPS Ozone Nadir Profile IP	TBD MB/data-day

3.5.2 Ingest Rate

3.5.2.1 The OMPS PEATE shall be capable of ingesting newly acquired data from the SD3 or ADS at a 2x rate (nominal 1x rate plus spare capacity for catching up).

3.5.3 Data Processing Rate

3.5.3.1 The OMPS PEATE shall be capable of running a single version of all of its science algorithms together at a 100x rate (as compared to the rate at which the RDR data were collected).

3.5.4 Data Processing Volume

3.5.4.1 The OMPS PEATE shall be capable of processing any desired set of OMPS data, up to and including the full mission data set, from RDRs to ozone CDRs. [this requirement is in support of tracking changes in calibration over the life of the mission and for evaluating overall algorithm improvement impacts]

3.6 Implementation Constraints

3.6.1 The OMPS PEATE shall support the following languages:

3.6.1.1 Perl

3.6.1.2 C

3.6.1.3 Fortran

3.6.1.4 HTML

3.6.1.5 Java

3.7 Documentation Requirements

The OMPS PEATE shall provide documentation in support of algorithm improvement software development to include the following:

3.7.1 Delivery Guide that explains how to deliver candidate algorithm improvements into the OMPS PEATE for automated execution.

3.7.2 Development Guide that explains how to structure candidate algorithm software so that it will gracefully integrate into the automated processing system.

3.7.3 Project Conventions and Standards (a very *short* document that explains all the requirements imposed on OMPS PEATE system software as well as on science algorithm software)

3.7.4 CM Plan that explains how CM is accomplished within the OMPS PEATE (includes an appendix with CM step-by-step procedures with examples for the NASA OMPS Science Team).

3.8 Security

3.8.1 Standard NASA security procedures shall be implemented within all parts of the OMPS PEATE.

3.8.2 Controlled procedures shall be defined and implemented for altering the automated processing system's configuration.

3.8.3 The OMPS PEATE operator interface shall have limited privileges such that an operator will not be able to change the configuration of the OMPS PEATE or alter data.

3.9 Support Requirements

3.9.1 The OMPS PEATE shall be staffed 5x8 with unattended operation after hours and during holidays.

3.9.2 The OMPS PEATE shall provide resources to design, implement, port, debug, and test candidate algorithm improvements (C and Fortran compilers, debuggers, editors, and other standard software development tools).

3.9.3 The OMPS PEATE shall provide resources to visualize and manipulate data (i.e., IDL, h5view).

3.9.4 The OMPS PEATE shall provide 3rd party libraries and tools that are necessary for developing candidate algorithm improvements (e.g., HDF, IMSL, FFT package, etc.).

3.9.5 The OMPS PEATE shall provide a web-based bulletin board where problems needing algorithm improvements can be posted and tracked.

3.9.5.1 The bulletin board shall be open for posting by any member of the NASA OMPS Science Team.

3.9.5.2 The bulletin board shall be visible to the "world."

3.9.5.3 The bulletin board shall be moderated.

3.9.5.4 The bulletin board shall permit capture of a problem identifier (tracking number), problem description (text), problem examples (images), problem stimulus (input data sets that demonstrate the problem).

3.9.5.5 The bulletin board shall permit display of the problem's status (and event dates) as the problem is being worked.

3.9.5.6 The bulletin board shall capture and display final resolution when the problem is closed.

3.9.5.7 The bulletin board shall provide for categorizing problems into arbitrary groups.

3.9.5.8 The bulletin board shall provide a summary view (one-liners for each problem sorted by categories and by status)

3.9.6 The OMPS PEATE shall provide an intranet-style web site for information dissemination to the NASA OMPS Science Team.

3.9.7 The OMPS PEATE shall provide an electronic library for a variety of project reference documentation including the following:

3.9.7.1 The library shall permit capture and management of externally generated electronic documents, manuals, user guides.

3.9.7.2 The library shall permit capture and management of internally created documents.

3.9.7.3 The library shall permit capture and management of white papers.

3.9.7.4 The library shall permit capture and management of project notes and miscellaneous reference material.

3.9.7.5 The library shall permit restrictions that are placed on individual documents.

3.9.7.6 The library shall permit access to restricted documents based on group membership.

3.9.7.7 The library shall be a self-service resource (i.e., no librarian – it shall be a searchable repository with a number of published policies for people to follow).

3.10 System Qualification Requirements

3.10.1 The OMPS PEATE functions shall be reviewed at a TBD time by developers of other OMPS PEATEs.

3.10.2 The OMPS PEATE functions shall be reviewed at a TBD time by the NASA OMPS Science Team (the people that will write science improvement software to run on the OMPS PEATE).

3.10.3 The OMPS PEATE shall support a number of TBD pre-launch interface tests imposed by the project.

3.10.4 The OMPS PEATE shall be demonstrated using an "hour in the life" test that shall be completed in less than one day.

3.10.5 The OMPS PEATE shall be demonstrated using a “day in the life” test that shall be completed in less than three days.

3.10.6 The OMPS PEATE shall be demonstrated using a “week in the life” test that shall be completed in less than ten days.

A Glossary

ADS Archive and Distribution Segment

ATBD Algorithm Theoretical Basis Document

ATMS Advanced Technology Microwave Sounder

C3S Command, Control, and Communications Segment

CARS Climate Analysis Research System

CDR Climate Data Record

CIR Community Information Repository

CrIS Cross-Track Infrared Sounder (CrIS)

CLASS ???

CM Configuration Management

CONOP Concept of Operations

DEM Digital Elevation Model

EDR Environmental Data Record

ENVI software from RSI for visualization, analysis, and presentation of digital imagery

ESA European Space Agency

FLINT Fortran LINT

GOME Global Ozone Monitoring Experiment

HDF Hierarchical Data Format

IDL Interactive Data Language (software from RSI)

IDPS Interface Data Processing Segment

IPO Integrated Program Office

LINT static source code analyzer for C

LSS Launch Support Segment

LV Launch Vehicle

NASA National Aeronautics and Space Administration

NCST NASA NPP Characterization Support Team

NESDIS National Environmental Satellite, Data, and Information Service

NOAA National Oceanic and Atmospheric Administration

NPOESS National Polar-orbiting Operational Environmental Satellite System

NPP NPOESS Preparatory Project

OES Office of Earth Science

OMI Ozone Monitoring Instrument

OMPS Ozone Mapping and Profiler Suite

PEATE Product Evaluation and Test Element

PSG ???

PST Project Science Team

QA Quality Analysis

RDR Raw Data Record

RSI Research Systems Inc.

SBUV Solar Backscatter Ultra Violet instrument

SCIAMACHY SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (an instrument on board the ESA Envisat satellite)

SDR Sensor Data Record

SDS Science Data Segment

TOMS Total Ozone Mapping Spectrometer

VIIRS Visible-Infrared Imager Radiometer Suite